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Blood Protein Changes Resulting from the Intravenous Method of Hyperimmunisation Against Rinderpest Virus

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It has been shown in previous articles[1,2,3] that certain changes take place in the proportions of the main protein fractions of the blood during an attack of rinderpest and as a result of immunisation or hyperimmunisation against this virus. The various protein fractions have been estimated by Howe's micro-method[4] and, with this technique of separation, increase in antibody content is reflected in lowered albumin proportions and an increase in the globulin fraction. Usually the euglobulin proportions are markedly increased but occasionally the pseudoglobulin fraction shows the greater proportional increase. This indicates that the new protein formation, which accompanies antibody production, is characterised by a solubility in sodium sulphate solution on the border-line of separation between Howe's euglobulin and pseudoglobulin fractions.

In this previous work[2] hyperimmunisation was done by the intrarumenal and intramuscular routes, and it was shown that, whereas the latter method produced a marked and constant change in the proportions of the globulin fractions, the intrarumenal method gave inconstant variations. If these protein changes reflect the antibody changes, even though they are not directly proportional to antibody formation, this previous work would indicate that intrarumenal hyperimmunisation would produce a more variable and less potent antiserum than the intramuscular method. This is actually what practical experience of the sera has proved.

Recently the opportunity arose to study the protein changes resulting from hyperimmunisation by the intravenous injection of large quantities of virulent blood. This paper records the protein changes of three animals studied, together with those in a fourth ox given virulent blood and an extract of virus-containing organs intrarumenally from the same virus donor.

It has been stated by Van Saceghem[5] that hyperimmune serum made by the intravenous method is superior to that obtained by other techniques. Its preparation, however, has one serious drawback. It frequently happens that the recipient of a large volume of virulent blood intravenously, collapses soon after the operation, and death occurs in a number of cases. Before the great war of 1914-18 the Germans used this method of hyperimmunisation fairly extensively in this laboratory, and Richter[6] states that the mortality varied from 6 to 20 per cent. The method was used again after the cessation of hostilities, but Hornby[7] reports that the death rate at times exceeded 10 per cent. and the method was abandoned as a routine measure. It was subsequent to this that the intrarumenal technique was adopted as being more humane than the painful intramuscular method, and because the serum obtained from intrarumenal hyperimmunisation was found adequate to protect the local zebu cattle.

Ox 4734.—This ox was in for his third hyperimmunisation and received 500 ml. virulent blood intravenously, and no symptoms of shock occurred after the injection of virulent blood. Analyses were made on the serum of this ox at the time of hyperimmunisation and when he was bled for serum 13, 19, and 25 days later.

The serum protein changes are shown in Table I.

From these figures it is seen that the total protein, total globulin and euglobulin showed quantitative increases and that the total amount of serum albumin decreased as a result of hyperimmunisation. Also the proportional amounts of total globulin and euglobulin showed marked increases and the proportional amount of albumin was correspondingly decreased. In this case, though the actual amount of pseudoglobulin increased, the proportional amount of this fraction was not raised significantly. These changes are exactly as found in previous hyperimmunisation studies, both in this laboratory and in other parts of the world.

TABLE I

SERUM PROTEIN CHANGES FOLLOWING INTRAVENOUS HYPERIMMUNISATION
(Ox 4734)

Days After Injection	0	13	19	25
Total N%	1·1928	1·4378	1·2004	1·1662
Non-protein N% ...	0·0296	0·0280	0·0252	0·0252
Total protein N% ...	1·1632	1·4098	1·1752	1·1410
Euglobulin N% ...	0·1148	0·3619	0·2260	0·1941
Pseudoglobulin N% ...	0·4040	0·5024	0·4344	0·4075
Total globulin N% ...	0·5188	0·8643	0·6604	0·6016
Albumin N%	0·6444	0·5455	0·5148	0·5394
Euglobulin as % of total protein	9·87	25·67	19·23	17·01
Pseudoglobulin as % of total protein ...	34·73	35·64	36·96	35·71
Albumin as % of total protein	55·40	38·69	43·81	47·28

In the previous article[2] the changes in the proportional amounts of euglobulin were classed as "not significant," "moderate" or "marked" according to whether the euglobulin fraction formed up to 15 per cent., from 15 to 20 per cent., and over 20 per cent. respectively of the total serum proteins. On this system of classification, the changes of euglobulin for ox 4734 were classed as significant.

The proportional amount of euglobulin in the serum obtained from the first bleeding was as high as that recorded[2] for the first bleedings from oxen hyperimmunised intramuscularly and those giving marked reactions following intrarumenal hyperimmunisation with either virulent blood or the extract of pulped virus-containing organs. It is interesting to note that, in this intravenously hyperimmunised ox 4734, the proportional amount of euglobulin in subsequent bleedings fell off more rapidly than was recorded for sera from intramuscularly hyperimmunised oxen.

Ox 5154.—This ox resembled the previous ox in that he was in for the third time of hyperimmunisation. He was given 500 ml. virulent blood intravenously and showed no ill-effects. The changes in the serum proteins are recorded in Table II.

TABLE II

SERUM PROTEIN CHANGES FOLLOWING INTRAVENOUS HYPERIMMUNISATION
(Ox 5154)

Days After Injection	0	13	19	25
Total N%	1·2286	1·4000	1·3650	1·2120
Non-protein N% ...	0·0296	0·0280	0·0380	0·0252
Total protein N% ...	1·1990	1·3720	1·3270	1·1868
Euglobulin N% ...	0·1129	0·2388	0·2039	0·1845
Pseudoglobulin N% ...	0·0472	0·6090	0·5399	0·4832
Total globulin N% ...	0·5871	0·8478	0·7438	0·6677
Albumin N%	0·6119	0·5242	0·5832	0·5191
Euglobulin as % of total protein	9·42	17·41	15·37	15·54
Pseudoglobulin as % of total protein ...	39·55	44·39	40·68	40·71
Albumin as % of total protein	51·03	38·20	43·95	43·75

The changes observed in the actual amounts of the total serum proteins and of the various protein fractions, as well as in the proportional amounts of the latter, are typical of those following hyperimmunisation against rinderpest virus. In this case, however, the pseudoglobulin fraction showed a slight proportional increase whilst the euglobulin proportional changes were not so great as for the previous ox. Only a "moderate" change took place in the euglobulin percentages. The rate at which

the euglobulin proportions decrease with subsequent bleedings was not so pronounced as for ox 4734, though, even at the third bleeding, the serum from ox 4734 showed a greater change in the proportions of the total globulin fraction than was observed for this ox 5154.

Ox 4151.—Unlike the two previous oxen, this animal was in for the 18th time of hyperimmunisation. He was given 500 ml. virulent blood intravenously and showed marked symptoms of shock and was seriously ill following the injection. However, this ox survived and was used for serum production though his companion, who also showed serious symptoms of shock, collapsed and died.

Table III summarises the serum protein changes observed.

TABLE III

SERUM PROTEIN CHANGES FOLLOWING INTRAVENOUS HYPERIMMUNISATION
(Ox 4151)

Days After Injection	0	13	19	25
Total N%	1·0563	1·2782	1·1858	1·1018
Non-protein N% ...	0·0321	0·0280	0·0420	0·0392
Total protein N% ...	1·1645	1·3440	1·2158	1·1788
Euglobulin N% ...	0·1069	0·3758	0·2849	0·2268
Pseudoglobulin N% ...	0·4482	0·5364	0·4735	0·4303
Total globulin N% ...	0·5551	0·9122	0·7584	0·6571
Albumin N%	0·6094	0·4318	0·4574	0·5117
Euglobulin as % of total protein	9·18	27·96	23·43	19·24
Pseudoglobulin as % of total protein ...	38·49	39·91	38·95	36·50
Albumin as % of total protein	52·33	32·13	37·62	44·26

The serum protein changes follow the typical course but, in this ox serum, the proportional increase in the euglobulin fraction was more marked than in the case of ox 4734, and the euglobulin content decreased less rapidly during the course of the next three and a half weeks. In fact the serum of this ox resembled more closely the previously recorded figures for intramuscularly hyperimmunised oxen. The pseudoglobulin fraction showed no significant changes in its proportional amounts.

Ox 3875.—This ox was an old serum producer and was in for his 23rd hyperimmunisation. He was given 2 litres of mixed virulent blood and extract of virus-containing organs intrarumenally. His serum protein changes are shown in Table IV.

TABLE IV

SERUM PROTEIN CHANGES FOLLOWING INTRARUMENAL HYPERIMMUNISATION
(Ox 3875)

Days After Injection	0	13	19	25
Total N%	1·0563	1·2782	1·1858	1·1018
Non-protein N% ...	0·0252	0·0252	0·0140	0·0252
Total protein N% ...	1·0311	1·2530	1·1718	1·0766
Euglobulin N% ...	0·0930	0·1617	0·1465	0·1286
Pseudoglobulin N% ...	0·3993	0·4799	0·4384	0·4089
Total globulin N% ...	0·4923	0·6416	0·5849	0·5375
Albumin N%	0·5388	0·6114	0·5869	0·5391
Euglobulin as % of total protein	9·02	12·90	12·50	11·94
Pseudoglobulin as % of total protein ...	38·72	38·30	37·41	37·98
Albumin as % of total protein	52·26	48·80	50·09	50·08

The general trend of these protein changes follows the typical course, but the extent of the changes, particularly in the proportional amounts of euglobulin, is very much less than for the three previous cases. These euglobulin changes are no higher than those previously recorded[2] following the intrarumenal injection of normal blood or diluted colostrum. On the other hand, 4 of the 11 cases reported upon in this earlier article for cattle given virulent blood intrarumenally also showed serum protein changes of the same magnitude as those recorded for this ox 3875. It was pointed out that changes of this magnitude are "not significant" and the animals cannot be considered as being successfully hyperimmunised.

As a comparison with the intravenously hyperimmunised oxen, this intrarumenally injected ox did not serve its purpose, but the results obtained indicate that the changes reported for the first three oxen are real and not artifacts of the analytical procedure.

DISCUSSION

The intravenous method of hyperimmunisation against rinderpest virus has been shown to give the same type of serum protein changes as are produced by the intramuscular, intrarumenal and subcutaneous methods. The decrease in the proportions of euglobulin with successive bleedings takes place more rapidly than recorded previously with intramuscularly and intrarumenally produced serum. The initial rise in euglobulin proportions is as marked as in other methods of hyperimmunisation so that the more rapid fall in euglobulin content is all the more surprising.

There does not appear to be any obvious reason for this more rapid fall in euglobulin content, but it may be associated with the more rapid destruction of virus in this method of hyperimmunisation. The total quantity of virus given is less than in the intramuscular or intrarumenal methods and, because the virus is injected directly into the blood stream, more rapid inactivation of virulent material will take place in the immune blood of the serum maker. If this happens, then there will presumably be a smaller production of antibodies, from this smaller amount of antigen, than when more massive doses of antigen are given by the intramuscular or intrarumenal methods. The slower fall of euglobulin in the case of ox 4151 may possibly be connected with the shock following injection of the donor's blood, because antibodies will be developed against the dissimilar components of the donor's blood in addition to those formed against rinderpest virus.

Summary

(1) The serum protein changes following the intravenous method of hyperimmunisation against rinderpest virus are of similar type and magnitude to those following successful hyperimmunisation by the intramuscular and intrarumenal routes.

(2) The euglobulin decrease following repeated large bleedings was more rapid than previously noted. This may possibly be due to a smaller antibody production resulting from the possible partial inactivation of the smaller injection of antigenic material in the cases examined.

Acknowledgments. — It is with pleasure that I record my indebtedness to the Director of Veterinary Services and to Mr. S. A. Evans, Senior Veterinary Research Officer, who provided the facilities for this work, and to Mr. F. G. Waddington, in whose professional care the animals were kept.

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URGENCY OF ANIMAL DISEASE CONTROL

"If we need land improved to carry more livestock greater attention should be paid by committees to regulation and health of stock," writes the Agricultural Correspondent of *The Daily Telegraph* in a recent issue of his paper. "We all know how extensively the crops have been planned. Planning of stock has been little heard of.

"A widespread, simple system of milk recording would make for both efficiency and economy of feeding-stuffs on dairy farms. It is bookwork and unattractive, but it would produce remarkable results.

"How many millions of gallons of milk and hundredweights of meat are lost every year through disease? Can this state of affairs be tolerated now? For months there have been talks between the Ministry, the veterinary surgeons and the farmers on this subject. Some progress has been reported, but the nation is entitled to ask how much longer it must wait to see appropriate measures enforced to save the herds from disease."

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WEEKLY WISDOM

There is no standing still in medicine. The young doctor soon finds out that much of what he learned in school turns out to be premature. Time eliminates the non-essentials.—A. E. Hertzler, "The Horse and Buggy Doctor."

CLINICAL COMMUNICATIONS

Use of Staphylococcal Toxoid in the Field

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Further to Mr. Gould's recent article on use of Staphylococcal Toxoid in the Field, I record the following cases and my appreciation of the kindness of Dr. Montgomerie (Wellcome Laboratories), who supplied the toxoid.

1. Cow calved several months. The owner complained that the milk quickly became sour. On examination, the cow showed no general or local disturbance. A milk sample was sent to the laboratory and the owner advised on the subject of handling of milk. The laboratory having reported the presence of *Staph. aureus* in samples, the cow was treated with staphylococcus toxoid and a later report from the laboratory stated that the samples were then free from pathogenic organisms.

This case is of interest since I had communicated with Dr. Montgomerie on the subject of treating what might be called sub-clinical cases of staphylococcus infection, and it was pointed out to me that opportunity of using the toxoid had been confined to hyper-acute cases and there were doubts of its working so well in the less acute case.

2. Cow recently calved. Two quarters were somewhat indurated (these had been lanced by the owner of the cow some time previously when the cow was dry) and gave clots in the milk. The animal exhibited a slight rise in temperature. The laboratory reported the presence of *Staph. aureus* in the milk from all four quarters. The cow was treated with toxoid and when the milk was re-sampled later the laboratory reported it free from mastitis organisms.

3. A heifer, newly calved. She was giving thick milk (in this herd we find a number of heifers calving down with streptococcus mastitis). Samples were taken and meantime the animal was put on sulphanilamide in usual dosage. Whilst awaiting the report (which stated that the heifer was free from infection), the milk became normal. About one month later this animal again gave thick milk without any general or local disturbance, and the laboratory report indicated that the right fore and both hind quarters showed *Staph. aureus* infection. Treated with toxoid and recovered (laboratory confirmed).

4. A recently calved cow. This animal was affected with *Staph. aureus* infection in one quarter (the right fore), which was swollen and giving thick milk. She showed a rise in temperature and was off her feed. Prior to treatment with staphylococcus toxoid, this animal had been treated with full doses of M & B 693, but continued to show evidence of infection (laboratory confirmation). After treatment with staphylococcus toxoid, however, the milk was reported free from infection.

These cases each received three doses of toxoid, allowing an interval of three days to elapse between doses, which consisted of one of 10 c.c., one of 15 c.c., and one of 20 c.c. toxoid.

After treatment with toxoid, a period of approximately 14 days was allowed to pass before samples were forwarded to a laboratory for report.

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Pregnancy Toxaemia of Ewes

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"Affected ewes are dull, off feed, and later may stand alone by a fence for hours. Vision and gait are both impaired. Mortality is very high and curative treatment is not very successful." (Lyle Stewart. Report on research work into sheep and lamb diseases. 1942.)

Having completed an investigation into this condition in a flock of 200 ewes, many of which had died, and having come to a tentative conclusion as to the cause, using the symptoms as a base, I attempted treatment with the result that seven ewes out of seven affected were brought back to normality and to a successful parturition.

The symptoms were as described above by Lyle Stewart, but one noticed in addition, constipation (in one case a badly impacted bowel with the voidance, after treatment, of hard dry faeces covered with blood and mucus), tachycardia, suppression of urine—or at best a small quantity was voided—and in the majority of cases a persistent recumbent position was maintained.

In the badly impacted and haemorrhagic case the ewe stood quietly, and in one other case the ewe had most certainly an "ambulatory complex." She was not entirely blind for the first two days and simply kept walking, hour after hour. On the third day she was completely blind and her perigrinations ceased. She was normal on the fourth day.

This condition, which is well known locally as "snow-blindness," occurs only during a *continued* cold spell with snow and keen frosts. Mortality is high, but if the ewe is close to parturition and can give birth to her lambs she will, as a rule, recover and be normal within a few hours.

This toxaemia, to my mind, points to an imbalance of the sympathetic system, and this gave me a clue as to treatment, for, when the humoral theory of the transmission of the nerve impulse in the autonomic system became firmly established, a wide field was opened for the therapeutic use of *acetylcholine*, in all states of autonomic imbalance with a *preponderating* SYMPATHETIC EFFECT." To clarify my theory that the condition may be "an autonomic imbalance with a preponderating sympathetic effect," I shall quote further from a brochure issued by May and Baker (Dagenham), Ltd., on acetylcholine bromide.

"The modern conception of the autonomic nervous system divides autonomic nerves into *cholinergic* (parasympathetic) and *adrenergic* (sympathetic), the former, when stimulated, liberating acetylcholine at their terminations, and the latter liberating sympathin, a substance analogous to, and probably identical with, adrenalin. It will thus be appreciated that acetylcholine is a hormone, comparable to adrenalin, but with *antithetical properties*. It is well known that the therapeutic administration of adrenalin produces all the effects of stimulation of the *sympathetic nerves*, resulting in tachycardia, vasoconstriction, rise in blood-pressure, and *arrest* of gastric and intestinal peristalsis.

"It would be expected that acetylcholine, the *para*-sympathetic hormone, would produce *exactly contrary* effects, and that this *does in fact occur* has been demonstrated experimentally and clinically.

"*Injected into the circulation, acetylcholine brings about an increased secretion of the salivary, gastric, intestinal and sweat glands. It also causes vasodilatation with a consequent fall in the blood pressure, slowing of the heart, contraction of the smooth muscle of the stomach, intestine, bronchi, uterus and bladder.*" (my italics). [All of which I consider to be necessary in the treatment of this condition in ewes, and which I also think is brought about by the act of parturition as, after the lambs are born, there is a rapid return to normal.] "The action of acetyl-choline on the bladder is to cause contraction of the detrusor and relaxation of the sphincter and trigone, and is thus useful in the retention of urine."

Perhaps seven cases are not sufficient to justify a definite opinion, but reference to them may lead to some further research on the same lines. The method of treatment I adopted with such satisfactory results was as follows:

1st Day.—Subcutaneous injection of 1 c.c. of the choline preparation into seven affected ewes.

2nd Day.—Only two doses were necessary as the other five were considered to be normal. The two doses were for (1) the "ambulatory" ewe and (2) for the ewe with the impacted and haemorrhagic bowel.

3rd Day.—Only one dose was necessary for ewe No. 1, which was now completely blind, and we considered that No. 2 was so much improved that further treatment was not necessary.

4th Day.—Telephone message to say that both 1 and 2 were normal and that ewe No. 2 had twin lambs.

Acetylcholine is valuable in the treatment of tachycardia, in embolism of the retinal and other eye conditions, so that altogether the injection of choline preparations seems to be a rational procedure in these cases.

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Successful Ejection of a Mummified Foetus

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Subject.—Four years old white Shorthorn cross-bred cow.

History.—Calved first calf February, 1941. Purchased and served on March 3rd, 1941; hence due to calve the following November.

Symptoms.—As the cow had not calved by January, 1942, I was asked to examine her, which I did on January 14th. Examination revealed the cow to be pregnant, and a diagnosis of mummified foetus was given.

Treatment.—Not knowing what to do, and as a "shot in the dark," I gave 125 R.U. of prolan (Bayer), but without results.

On March 9th a further examination was made, when the foetus was found to be still present. Stilboestrol dipropionate 2½ c.c. (10 mgm. per c.c.) was injected intramuscularly on the same day and the cow passed the foetus 40 hours afterwards without trouble.

This case is recorded as it confirms the results obtained in two similar cases as published in the issue of *The Veterinary Record* dated March 7th, 1942.

ABSTRACT

[TESTING CATTLE WITH JOHNIN. BEING A REPORT ON THE VALUE OF THE INTRADERMAL TEST ON CATTLE. *J. Hygiene.* (1941.) **41.** 297-319. (The Agricultural Research Council's Committee on Johne's Disease.)]

In 1932 the Agricultural Research Council appointed a committee on Johne's disease. The committee decided to study the reaction of infected and non-infected cattle to the double intradermal johnin test, the reliability of johnins prepared by different laboratories, the results obtained by different observers in reading and interpreting the results of the test, and the *post-mortem* findings in reactors and non-reactors.

Three series of experiments were conducted. The first two were on a small scale (10 and 12 animals respectively) and the results were inconclusive as regards different johnins, although the first experiment suggested that avian tuberculin was less reliable than the johnins used.

The third experiment was carried out during 1936-1938 at Islington abattoir on 300 cattle, the animals being as far as possible unselected. Of these animals 104 were selected for *post-mortem* examination, a representative number being chosen in each of four groups as follows: (1) Animals which failed to react to both johnin and tuberculin. (2) Reactors to both reagents. (3) Reactors to tuberculin but not to johnin. (4) Reactors to johnin but not to tuberculin.

The reagents used for the double intradermal test in each animal were: (1) Synthetic medium tuberculin, concentrated by precipitation with ammonium sulphate. (2) Heat concentrated johnin prepared from a synthetic medium which did not contain *M. phlei*. (3) Johnin prepared from a synthetic medium with *M. phlei* and concentrated by ammonium sulphate precipitation.

The cattle were slaughtered immediately after the tests, which were read at 72 hours by three different observers. A careful *post-mortem* examination was made and the intestines, together with the mesenteric and other lymph nodes, were examined at one of three laboratories (Research Institute in Animal Pathology, Camden Town; Institute of Animal Pathology, Cambridge; Farm Laboratories of the National Institute for Medical Research, Mill Hill). The material was spread almost equally between the three laboratories so that each investigator examined material from approximately one-third of the 104 cattle.

Examination of the lymph nodes for tuberculosis was in the first instance macroscopic and by smears; if this yielded negative results material was treated with antiformin and inoculated into guinea-pigs. Similar material was sown on media suitable for the detection of Johne's bacilli. Smears were made from various parts of the intestine and examined for Johne's bacilli, and if these were negative scrapings of intestine, taken especially from the ileo-caecal valve and ileum, were treated with antiformin and examined culturally for Johne's bacilli. Small portions of the small and large intestine were also examined histologically for evidence of Johne's disease.

The results of the work are recorded in tabular form and only a brief summary can be given here. In animals of category 1 (tuberculin and johnin negative) the tests and *post-mortem* findings agreed in 17 of 20 cattle (85 per cent.). In category 2 (tuberculin and johnin positive) the figure was 8 of 33 animals (24·2 per cent.). In category 3 (tuberculin positive, johnin negative) agreement was obtained in 6 of 9 cattle (66·6 per cent.). The fourth category (tuberculin negative, johnin positive) included 15 of 36 cattle (41·7 per cent.) in which the tests and *post-mortem* findings agreed. Taking categories 2 and 4 together, a total number of 69 animals reacted to the johnin test and in these animals the test and *post-mortem* findings were in agreement in only 23 (33 per cent.). Of the 46 johnin reactors which failed to show evidence of the disease at autopsy, 24 reacted also to the tuberculin test and it is suggested that the presence of tuberculosis may in some cases have been the cause of the positive reaction to johnin.

The results suggest that examination of a herd by the double intradermal johnin test might result in the condemnation of animals, only one-third of which would in fact be affected with the disease. Moreover, about one-fifth of undoubted cases of Johne's disease would probably be missed. It should be stressed, however, that the difficulty of diagnosing Johne's disease at autopsy, even by a combination of macroscopic, histological and cultural methods of examination, is considerable and it is probable that a number of cases of the disease would not be recognised *post-mortem*.

Of the two johnins employed the heat-concentrated product yielded more and sometimes larger reactions and it would seem that the ammonium sulphate-precipitated product is to be preferred. Twelve cattle which were positive to the heat-concentrated johnin and negative to the precipitated johnin failed to show evidence of Johne's disease *post-mortem*. On the other hand, in two animals in which the reaction to the heat-concentrated johnin was positive and which failed to react to the precipitated johnin there was definite evidence of Johne's disease at autopsy. The disease was present in six animals which failed to react to either johnin.

Examination for avian tubercle bacilli was carried out by only one of the investigators and this organism was found in six of the cattle, although its presence was suspected in a further six animals. It is probable that some of the reactors to johnin which failed to show evidence of the disease at autopsy were infected with the avian tubercle bacillus and this may have accounted for the discrepancy in some cases.

Taking all the results into consideration, there was no substantial evidence to suggest that Johne's disease sensitizes animals to tuberculin.

At first sight this report would seem to have failed to establish the double intradermal johnin test as a reliable specific for the detection of Johne's disease, but it is pointed out that the high proportion of reactors to the test which failed to show evidence of the disease at autopsy may have been due to failure of the methods employed to detect the organism responsible for the sensitisation.

Some of the causes of the unsatisfactory position and lines along which further research are needed include:—

1. The preparation of a specific and potent johnin.
2. Improved cultural methods for the isolation of Johne's bacilli from infected material.
3. Further work is needed in an attempt to find a laboratory animal susceptible to infection with Johne's bacilli.
4. The incidence of avian tuberculosis infection in cattle should be investigated and the relation between positive reactions to johnin and the presence of avian or bovine tuberculosis studied.

E. G. W.

REPORT

[NATIONAL INSTITUTE OF RESEARCH IN DAIRYING: Report for the year 1940.]

Unfortunately this report comes to hand more than twelve months after the events which it records have taken place, so that much of the information is now in the lockers of history and many of the problems planned have been carried through to completion.

It was only to be expected that long range projects should be laid aside and matters of immediate importance substituted. The major problem envisaged was to improve the quality and quantity of milk. Though, as pointed out in the preface, much is known already about these two aspects, war imposes conditions which are likely to interfere with both and make the measures projected more difficult of application.

The report is produced on the same lines as those of previous years, summarised editions of the work of each department being presented as under:—

Dairy Husbandry.—A general survey of the crops and stock on the farm is given, reference being made to the measures taken to control mastitis and contagious abortion. Experiments were designed to discover the protein requirements of dairy cows for milk production and the value of urea, yeast and caustic soda-treated straw as fodder substitutes. In the case of pigs, cooked potato flakes, acorns, kitchen-waste and cocoa meal were compared as foods.

Chemistry.—Certain aspects of the compositional quality and physico-chemical properties of milk were investigated. These included an enquiry into the factors affecting the solids-not-fat, freezing point, and the distribution of nitrogenous bodies in milk. The Gold Sol test for mastitis was also explored.

Bacteriology.—Enquiry was made into the best methods for controlling mastitis with special reference to the hygienic factors involved, disinfection, calfhood infection, and, on the laboratory side, to suitable media.

Dairy Bacteriology (Advisory).—Apart from his general work in the field the dairy bacteriologist examined 5,617 milk milk samples under the Special Designations Order, 1936, and 1,357 in addition for *M. tuberculosis*. Eleven and a half per cent. of single cow samples were found positive to the latter.

Physiology and Biochemistry.—Under the heading of Nutritional Studies are included a large variety of subjects relating to the nutritional value of milk. In the physiological section hormonal control of lactation and fertility took precedence.

The report concludes with a list of 67 articles by, or in collaboration with, members of the institute, published in the scientific and lay press.

N. S. B.

MEMOIR

George William Dunkin, 1886-1942

Major George William Dunkin, M.R.C.V.S., D.V.H., was born in Canterbury on July 26th, 1886, the son of Charles and Elizabeth Mary Dunkin of that city, and received his early education at Simon Langton School. After matriculating he proceeded to the Royal Veterinary College, London, where he graduated as a Member of the Royal College of Veterinary Surgeons in December, 1908. He subsequently studied at the University of Liverpool and obtained the Diploma of Veterinary Hygiene. From 1910 to 1914 George Dunkin was engaged in general practice at Canterbury where he laid the foundation of that practical experience which was later to be so useful to him in his research work.

When war broke out in 1914 he joined the R.A.V.C. and was appointed Veterinary Officer in charge at Canterbury. He was posted to Egypt in 1915 where he served with the 21st Veterinary Hospital and as Veterinary Officer to a remount depot. He was promoted to Major in 1917 and commanded the 20th Veterinary Hospital 1917 to 1919 and was mentioned in despatches. He subsequently returned to general practice where he rapidly gained a high reputation amongst his clients both in small animal and in farm animal practice. It was here that he co-operated with Professor J. B. Buxton in field experiments carried out by the former while in charge of the Medical Research Council's Field Laboratories at Mill Hill. Having thus got his taste for research he found no difficulty in accepting the invitation to succeed Professor Buxton at Mill Hill when the latter was appointed Professor of Comparative Pathology in the University of Cambridge.

Thus in 1923 came the great turning point in Major Dunkin's career and his transference from general practice to research. But his practical outlook was most necessary in his new post where he had to combine the duties of research with those of Superintendent of the Farm Laboratories at Mill Hill and to breed and provide great numbers of experimental animals, large and small, required by the Medical Research Council in the conduct of research.

Here he collaborated for a time with that great leader in research the late Captain Douglas and with Dr. Gye, now Director of the Imperial Cancer Research Laboratories. But his best work was done with the late Sir Patrick Laidlaw in connection with dog distemper (for some unknown reason Dunkin would never speak of that disease as canine distemper). Laidlaw and Dunkin confirmed the earlier work by Carré as to the virus origin of distemper and proceeded to elaborate the process of immunisation through the medium of the ferret. This discovery of the great usefulness of the ferret in the investigation of virus diseases was of fundamental importance and has formed the basis for further work in the investigation of serious virus diseases of man. The names of Laidlaw and Dunkin will be handed down to posterity on this ground alone. Johne's disease occupied much of Dunkin's time at Mill Hill. He did much to improve and facilitate the cultural growth of the causal organism and was responsible for the introduction of the intradermal johnin test on similar lines to that test for tuberculosis, and which is destined to play a great part in the control and eradication of that devastating disease of cattle.

In 1937, the Agricultural Research Council established their Field Station at Compton, Berks, and Major Dunkin was most fittingly appointed its first Director. The magnitude of his problem can be gauged by the fact that the Compton Manor Estate consisted of about 1,500 acres, with herds of Ayrshire and Friesian cattle and Large White pigs, and the new Director had in addition to supervise the designing and erection of entirely new research laboratories, their equipment and staffing. The new laboratories are remarkably fine and are the envy of most other research institutes. With all the facilities afforded by them and with the assistance of the excellent team of workers with whom he had been fortunate to surround himself, Major Dunkin had been looking forward to great developments.

It is a catastrophe for his profession and for agriculture in general that he should have been taken before this work could bear fruit.

Despite the calls on his time for research work, Major Dunkin made a point of entering wholeheartedly into the general activities of his profession. He was a member of the Board of Governors of the Royal Veterinary College and at various times President of the South Eastern, Central, Royal Counties and Veterinary Research Club Divisions of the N.V.M.A. He served on numerous committees of that body and as Chairman of some, notably the Small Animal Euthanasia Committee and the Editorial Committee. He was President of the Section of Comparative Medicine, Royal Society of Medicine, in 1936-7, and was a life member of the New York City Veterinary Medical Society. In 1929 Major Dunkin was elected member of the Council of the R.C.V.S., serving on a number of committees, and especially noteworthy as Chairman of the important Examinations Committee, an office he held at the time of his death. He was the recipient of many honours including the Victory Medal (Central V.S.) 1929; the Dalrymple-Champneys Award (N.V.M.A.)1936, Steel Memorial Medal (R.C.V.S.) 1941. Little was it thought when the President and Council awarded him the Steel Medal so recently that in so short a time he would be gone from us.

It is difficult to do justice to George Dunkin the man. He was so keen on his work and so industrious, yet always ready and anxious to give a helping hand to all who needed it. Fond of sport, enjoying a game of golf, hitting hard at lawn tennis, loving a quiet game of bowls or a hand at bridge. He had a very keen sense of humour, with a bright, cheerful and loving disposition. In short, he was " a great fellow " and " a great friend " and we shall miss him so much.

G. H. W.

Personal Tributes

Major Dunkin's Work at Compton

Mr. S. J. Edwards, of the Agricultural Research Council's Field Station, Compton, writes :—

By the death of Major Dunkin, the Field Station at Compton has lost its revered Director at a time when, its foundation having been but recently accomplished, it most required his inspiring leadership.

In October, 1937, he was charged by the Agricultural Research Council with the responsible task of developing a field station within the ambit of a large commercial farm. The function of the station was to carry out experimental work under controlled conditions not ordinarily obtainable in the field and, in addition, to breed large and small animals for the use of other research institutes. He at once applied himself to designing the plans of the new buildings with great care and vision, his chief concern being that they should include the best of modern developments in medical and veterinary research experience. It was not until

the end of 1938 that building operations commenced and from this time until their completion in 1940, he supervised every detail of the work and especially the construction of the small animal units. Here he brought into play the experience he had gained in planning a similar unit at Mill Hill, and he was able to incorporate certain improvements in design which would facilitate the control of epidemic disease. During this time, laboratory work connected with the diagnosis and control of disease in the farm stock was conducted in a small laboratory which Major Dunkin had converted from existing dairy premises and equipped very adequately.

When, in February, 1940, the Station was completed, he felt that the first landmark had been reached, and experienced great satisfaction in the successful accomplishment of his first task. With the unfavourable turn of the war in May, 1940, however, an opening ceremony was dispensed with and the Laboratory came quietly into use and attracted many visitors whom he was at all times delighted to welcome, and whose unfailing praise of the small animal units must have been a source of great pleasure to him.

Deeply patriotic, Major Dunkin began at this time to devote all his spare time to the organisation of civil defence in the neighbourhood. Nevertheless, he did not spare his untiring energy in planning the development of the Station, and in securing facilities not only for his own workers, but also for those of many other research institutes, to whom he extended freely his characteristic qualities of kindness and hospitality.

During 1940 he paid particular attention to the construction of experimental cattle units, and to the design of an isolation compound for use in the investigation of bovine contagious abortion. To their development he brought his great knowledge of the principles governing the control of disease under experimental conditions, based on his experience of this subject acquired during the pioneer work carried out by the late Sir Patrick Laidlaw and himself on canine distemper.

His immense practical knowledge was widely consulted by his colleagues in problems relating to the control of contagious disease in animals—both large and small—and he gave constant encouragement to endeavour made to keep the Compton stock free from disease.

Major Dunkin had also retained the impressions formed while engaged in veterinary practice at Canterbury, and he had sound advice to offer on the diagnosis and treatment of clinical conditions.

In all the estate workers he took the greatest interest, and no man passed unrecognised by him. He displayed great care for their welfare and was instrumental in effecting many improvements both in their homes and in their conditions of work. Approachable at all times, he showed an amazing patience in solving any difficulties affecting the well-being of his staff. With them he was prepared to be genial and there was no question of the respect and loyalty which he commanded.

In the social affairs of Compton village he felt impelled to act, since he thought that by this means only, could the status and culture of his estate workers be raised. He lived to see a great social uplift among the villagers, and his death has removed a revered figure from their midst. By his example, he encouraged the people to volunteer with the first in the Home Guard movement, and he developed the first Mounted Patrol in the country for guarding the Compton Downs. He gained the rank of Company Commander and through his untiring efforts encouraged his men to aspire to a very high standard of proficiency.

His untimely death is deeply lamented by his staff who had looked forward to many years of pleasant collaboration with him under the favourable laboratory and field conditions which he had so well conceived. His example of tolerance, loyalty and good comradeship were greatly admired and these qualities promoted a congenial atmosphere among his workers. In his professional life he set a standard which no younger member of the profession could fail to recognise as one requiring the strictest devotion to good principle and rectitude. To the day of his tragic illness he assigned himself unselfishly to his tasks, and his deep concern for the welfare of his Station was uppermost in his thoughts to the last.

. . . . . .

Lt.-Colonel P. J. Simpson, of Maidenhead, writes:—

It was my good fortune to make contact with the late Major G. W. Dunkin in 1916 on taking over command of a veterinary unit in Egypt of which he was second in command. During this time and subsequently he proved himself a good soldier. His strong sense of patriotism remained with him after demobilisation, as he was a strong supporter of the British Legion, and at the call in this present war he immediately took up Civil Defence duties and later raised a troop of mounted Home Guards in Compton and the surrounding villages.

It took little time for us to form a very close friendship which remained steadfast during the past 26 years. I was privileged to have his full confidence on all matters appertaining to his private and professional career. Thus I gained an insight into his character, vouchsafed to few outside his family.

Dunkin was a strong, virile man, upright in all his dealings and imbued with tenacity of purpose; to him, obstacles were only matters to be overcome. The advancement of the veterinary profession, as against his own personal aggrandisement, was always to the forefront in all his decisions. These features of his character were fortified by a very generous and sunny disposition.

In times of relaxation he could be the centre of merriment, but in more serious times, the strong concise speeches he made in the Council Chamber of the R.C.V.S. and other places showed that he expended time and thought on his views before voicing them.

By his death the profession has lost a brilliant member and many of us have lost a very dear and lovable friend.

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The Funeral

The funeral took place at Compton Church on Wednesday, March 25th, the service being conducted by the Rev. C. Jotcham, M.A.

Military honours were accorded. The procession to the church was headed by Home Guard area, zone and battalion officers and the Compton Home Guard Platoon. There was an escort of twelve Home Guard riflemen and six company commanders of the 5th Berkshire (Wantage) Battalion Home Guard acted as pall bearers. Final honours were paid by the sounding of the Last Post and the escort presenting arms.

The chief mourners were the widow, Mrs. G. W. Dunkin, Mrs. Buxton, sister, and Professor J. B. Buxton, M.A., F.R.C.V.S., D.V.H., brother-in-law, Mrs. Daley and Mrs. Berry, sisters-in-law, and Mr. J. C. Buxton, M.R.C.V.S., nephew.

There was a very large attendance of friends with many representatives of official and scientific bodies. Among those present were: Sir Joseph L. Arkwright and Dr. W. W. C. Topley, representing the Agricultural Research Council; Mr. E. H. E. Havelock, representing the Agricultural Research Council and Sir Edwin Butler; Lieutenant-Col. P. J. Simpson; Dr. F. Norman Smith, representing the Ministry of Health; Mr. W. A. Pool, representing the Royal Society of Medicine and the Imperial Bureau of Animal Health; Mr. T. M. Doyle, representing the Veterinary Laboratory of the Ministry of Agriculture, Weybridge; Dr. A. W. Stableforth, representing the Veterinary Research Club; Dr. J. T. Edwards, representing the Foot-and-Mouth Disease Research Station, Pirbright; Mr. C. A. McGaughey, representing Professor T. Dalling; Mr. K. C. Sellers, representing the Institute of Animal Pathology, Cambridge; Dr. W. R. Wooldridge, President, representing the National Veterinary Medical Association; Mr. E. J. Heather, President, representing the Royal Counties Division N.V.M.A.; Dr. N. S. Barron; Mr. H. Bell; Mr. J. Bell; Mr. G. H. Livesey, representing the Royal College of Veterinary Surgeons; Mr. H. W. Dawes, representing the Examination Committee, R.C.V.S., Dr. P. Hartley and Mr. R. E. Glover, representing the National Institute for Medical Research; Mr. C. G. Freke, representing the Governors of the Royal Veterinary College; Mr. G. P. Male and Mrs. Male; Mr. N. P. Male; Professor T. J. Bosworth and Dr. R. Lovell, representing the Research Institute in Animal Pathology of the R.V.C.; Mr. C. F. Formston, Mr. C. W. Ottaway and Mr. N. J. Scorgie, representing the Royal Veterinary College; Mr. J. W. H. Holmes, representing the Central Veterinary Society; Mr. R. M. Davidson, of the Ministry of Agriculture (Animal Health Division); Mr. C. M. Newsholm, Secretary of the Students' Union, Royal Veterinary College; Dr. S. J. Folley, representing the National Institute for Research in Dairying, of Reading University.

The following members of the staff of the Agricultural Research Council's Field Station at Compton: Mr. S. J. Edwards; Dr. R. S. de Ropp; Mr. D. L. Hughes; Mr. D. H. McCleod; Mr. A. A. Wilson and Mr. E. A. Macmillan, Farm Manager.

Representatives of the Police, A.R.P. Services, British Legion and employees of the Field Station.

Included in the large number of beautiful floral tributes were wreaths from many of Major Dunkin's fellow members of the profession, from veterinary associations, colleges and research institutes, from his military colleagues and from the staff at Compton.

BOVINE TUBERCULOSIS AND THE PUBLIC HEALTH

Presiding at the annual meeting of Exeter Dispensary, the Mayor (Mr. R. Glave Saunders, M.R.C.V.S.) said it was not generally realised that half the children in orthopaedic hospitals suffered from tuberculosis of bovine origin. The disease could be stamped out, as it had been in Canada. If the Government were to make an offer to the farmers to test their herds at national expense, providing the farmers agreed to mark the reactors so that the animals could not be sold on the open market, at the end of six years the disease would be eradicated and milk could be consumed without the necessity of pasteurising it.

Commending the work of the Dispensary, the Mayor said poor people were treated medicinally, and were therefore not subjected to the tender mercies of the patent medicine vendors. The Dispensary was a bulwark against quackery.

IN PARLIAMENT

The following question and answer are among those recently recorded in the House of Commons :—

ANIMAL FEEDING-STUFFS

Mr. R. MORGAN asked the Minister of Agriculture whether, as the compulsory use of wheatmeal flour which is shortly to be enforced will lead to a reduction in animal feeding-stuffs, he is taking steps to make good this deficiency ; and whether he can make a statement on this subject ?

Mr. HUDSON : Yes, Sir. During the summer rationing period certain reserve stocks of maize will be drawn upon. As regards next winter I hope that increased production of oats and other fodder crops, including silage, will offset the loss of wheatfeed. I am impressing upon farmers, including milk producers, the urgent need to become as nearly self-supporting as possible and to plan their spring cropping accordingly.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Apr. 11th.—Annual General Meeting of the Association of Veterinary Inspectors at the Imperial Hotel, Birmingham, 2 p.m.

Apr. 15th.—Meeting of the Section of Comparative Medicine, Royal Society of Medicine, at 1, Wimpole Street, W.1, 2.15 for 2.30 p.m.

Apr. 16th.—R.C.V.S. Committee Meetings, Hotel Russell, London.

Apr. 17th.—R.C.V.S. Committee and Council Meetings, Hotel Russell, London.

Apr. 17th.—Annual General Meeting of the Mid-West Division, N.V.M.A., at Bristol, 2.30 p.m.

May 11th.—R.C.V.S. Animal Management Examination begins.

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REFRESHER TUITION IN BOVINE PREGNANCY DIAGNOSIS AND TREATMENT FOR INFERTILITY

A further county is now to be covered in the Refresher Tuition Scheme : DERBYSHIRE. The instruction will be given by Mr. Sydney Jennings, M.R.C.V.S., of Knowle, Warwickshire. Any member wishing to participate who has not already notified the General Secretary can still be included if he sends his name, without delay, to the N.V.M.A., 10, Bore Street, Lichfield.

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PROTECTIVE CLOTHING FOR VETERINARY SURGEONS UNDERTAKING AGRICULTURAL PRACTICE

With reference to the arrangements which have been made to enable veterinary surgeons engaged in agricultural work to purchase coupon-free protective clothing, it will be necessary for any veterinary surgeon who wants a certificate for this purpose to furnish the Ministry (Animal Health Division, Fernlea Hotel, St. Annes-on-Sea, Lancs.) with a declaration to the following effect :—

> " I ....., a veterinary surgeon engaged in agricultural practice at....., hereby declare that I require for my own use in my agricultural practice the following articles of clothing :
> ..... ,,

It is important in order to save time and obviate correspondence that the declarations should follow as closely as possible the wording suggested above.

As the Ministry's certificates are issued to individuals, it will not be sufficient for an employer to make an application for his veterinary assistants ; each assistant should make his own application. Also each member of a firm of veterinary surgeons should make his own application since the certificates cannot be issued to firms.

Furthermore, since the certificates have to be surrendered to the traders, it is essential that applications for certificates should indicate whether more than one trader will be supplying the articles ; more than one certificate will be required if more than one trader is concerned.

The articles obtainable by means of these certificates are : rubber coat, parturition overall, overall coat, rubber boots (any variety) or, if these are unobtainable, working boots, leggings.

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SUPPLY OF TYRES TO VETERINARY SURGEONS

Following upon representations on the above matter, a reply has been received from the Tyre Control department of the Ministry of Supply, stating that within the next few weeks a scheme will be announced whereby tyres will be available for essential users, subject to certain conditions. The letter proceeds : " It is, therefore, hoped that veterinary surgeons will, in the interim, be able to keep their cars mobile by purchasing re-treaded or part worn tyres, or by having their existing tyres re-treaded. If, however, this should prove impossible in any particular case, the car owner should make direct application to this department for the tyres required, stating the following information, when special consideration will be given to the case : size of tyre required ; make of tyre required ; minimum number of covers and tubes required ; name and address of usual tyre supplier."

Applications should be addressed to the Ministry of Supply (Tyre Control), Empire House, St. Martin's-Le-Grand, London, E.C.1.

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Death of Mr. William Woods, of Wigan

To the many grievous losses which the veterinary profession has sustained of late, we deeply regret to have to add that of Mr. William Woods, M.Sc. (MANC.) (HON.), F.R.C.V.S., of Wigan, a member revered alike for his character, his attainments, and his outstanding services in many spheres of activity, whose death will be widely mourned in our community.

Pending the publication of a full account of Mr. Woods' career, we may briefly recall a few features of his busy life. This was happily epitomised by Professor Stocks, in presenting Mr. Woods to the Vice-Chancellor of the University of Manchester on the occasion of the conferment upon him in 1934 of the degree of Master of Science (*honoris causa*), as that of " a noted practitioner of veterinary medicine and surgery, whose long career has been continuously devoted to the improvement of the science of which he is a master." His work at Manchester University commenced in 1904 when the Diploma of Veterinary State Medicine was inaugurated, and the honour coincided with his resignation as Lecturer in Veterinary Hygiene. Mr. Woods' experience as an Examiner was unrivalled. First appointed by the R.C.V.S. in 1888 as Examiner in Surgery, he later gave many years of valued service in his special field—that of Hygiene and Dietetics.

Mr. Woods always had a strong sense of concern for the effective organisation of the members of his profession. He became a member of the Lancashire Division of the N.V.M.A. in 1884, and Divisional honours were a prelude to recognition of his worth in a wider sphere, for he occupied the Presidential Chair of the " National " in 1911-12, when William Hunting, founder of this journal, was Hon. Secretary and Professor Wooldridge Hon. Treasurer. Even greater, perhaps, was his enthusiasm in the cause of veterinary benevolence : the charities of the profession have never had a more devoted worker than William Woods, who was for years a tower of strength to the National Veterinary Benevolent and Mutual Defence Society as member of Council, Vice-President and President.

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R.C.V.S. OBITUARY

BYERLEY, Morris Grant, 56, South Street, Greenwich, London, S.E.10. Graduated London, July 7th, 1885. Fellowship April 28th, 1892. Died March 22nd, 1942; aged 76 years.

LOWNDES, John, 72, Morehampton Road, Dublin. Graduated Dublin, December 13th, 1928. Died March 15th, 1942.

Mr. John Lowndes, M.R.C.V.S., who died at 1, Galtrim Park, Bray, had an extensive practice in Co. Wicklow. He had also practised for a time in England.

WOODS, William, M.Sc. (MANC.) (HON.) F.R.C.V.S., Brentwood, Wigan Lane, Wigan, Lancs. Graduated N. Edinburgh, April 26th, 1881. Fellowship April 29th, 1886. Died March 23rd, 1942; aged 81 years.

PERSONAL

Mrs. Dunkin asks all members of the profession who have either written or sent flowers to her expressing their sympathy in her great loss, to accept her sincere thanks. Owing to the great number of letters she has received, she greatly regrets she is unable to answer each one individually.

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Marriage.—Balls—Rush.—On March 7th, at St. Michael's Church, Bramhall, Cheshire, Donald Vernon Balls, M.R.C.V.S., son of Mr. and Mrs. Vernon Balls, of Wimbledon, London, to Izabel Scott Rush, daughter of Mr. and Mrs. Ernest Rush, of Oporto, Portugal.

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ROYAL ARMY VETERINARY CORPS

The following announcement is made in the issue of *The London Gazette* dated March 20th, 1942: "The undermentioned Captains to be Majors, March 19th, 1942: L. W. Coulden (45117), J. V. Tevlin (45118)."

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THE NUTRITION SOCIETY

(*Continued from page* 133)

[Continuation of summarised papers and discussions at the second scientific meeting of the above Society, which was held on Saturday, February 28th, 1942, at the London School of Hygiene and Tropical Medicine, and which took the form of a whole-day Conference on "Food Production and Distribution in Relation to Nutritional Needs."]

(3) Mr. E. T. Halnan then presented a paper on "Animals as Food Converters." He said that animal foodstuffs could be divided into three categories, *viz.* succulents, coarse fodders, and concentrates. Whereas horses, dairy cattle and sheep were capable of dealing with all three types, pigs, especially young ones, and all poultry other than geese were able to make good use only of the concentrated foods. In war, priority must be given to those types of animals which could convert most efficiently those foods which were most readily available. Home-grown foodstuffs were mostly rich in carbohydrate and low in protein, and the direst need of our country if beleaguered was protein. Mr. Halnan then presented a series of calculations relating to the efficiency of the different species as converters of food, and was careful to draw a distinction between the efficiency on a short-term policy and that on a long-term one in which replacement was considered. On a long-term policy, the relative efficiency of the dairy cow was greatly lowered, whereas pigs and especially poultry were far less seriously affected. On a purely short-term policy the production of winter beef and of pork and bacon was justified on an energy, but probably not on a protein basis, whereas the reciprocal held for egg production. Dairy cows were now encroaching on the wheat offal supply hitherto regarded as primarily for pigs and poultry. In war-time the production of table birds—other than, perhaps, the small 1 to 1¼ lb. type designated *Petite Poussin*—was scarcely justified, but the same could not be said for eggs. Apart from small-scale rabbit production, the production of other types of meat was probably unjustified.

Dr. Duckham, in opening the discussion, said that such data as we possessed on the efficiency of animals as food-converters were not plentiful, but such as there were should be interpreted on a uniform basis. He agreed that there were many difficulties, *e.g.*, that of whether part of the cost of feeding the pregnant cow should be attributed to the calf or to the previous lactation, but stressed the need for authoritative interpretation in order to put an end to current confusion. The figures for relative efficiency should be based on what was possible now in war-time. Dr. Hammond asked, "Why should one animal be more efficient than another?" He himself attributed the differences to differences in cellular metabolism, and said that it was quite impossible to apply one figure in each and every case. At the beginning of lactation, *e.g.*, the mammary cells were more efficient than they were at a later stage, and breed differences existed. He thought that we should not just allocate priority supplies to "milk," but to those milk producers who had shown themselves to be efficient. Older animals laid down less protein than young ones, but on the other hand they were more efficient as storers of energy: this raised the question of which age was the most suitable for slaughter. We could not accept all the calculated figures for relative efficiency of conversion when it came to practical farming; the pig, *e.g.*, had a higher efficiency of conversion than had the beef animal, but the latter did not compete in the same way with man. Dr. Bigwood mentioned the position in Belgium, in which country, in pre-war days, some 12 per cent. of the national acreage had been devoted to arable crops, and had provided 34 per cent. of the total human calories requirements, whereas some 65 per cent. of the land had been in the form of pasture, and had contributed only 16 per cent. of the calories. The German policy since the time of the occupation had been to make the country more self-supporting. Another speaker stressed the danger of a wholesale reduction of beef cattle, and Mr. V. C. Fishwick said that Mr. Halnan's figures had a limited value as they stood, and that we must take into account the percentage of land occupied by the different species of food animals. Pigs and poultry, *e.g.*, took up relatively small areas. Professor D. M. S. Watson criticised the majority of experiments which had been conducted on the fattening of cattle, and presented diagrams showing the results of workers at the Missouri Agriculture Experiment Station. He interpreted these to mean that it was justifiable to raise beef animals to 2,000 lb. liveweight if they were to be used as a source of energy, rather than of protein, and if they were fed on a high plane of nutrition.

(4) Sir John Russell presented the last paper, which was entitled "Planning for Agricultural Production." He said that the variety of the soils and climate in Great Britain was greater than in that of any other country of comparable size, and that a great range of production was therefore possible. If optimum cropping only had been desired, we should, however, have restricted the arable land to a coastal strip running from about Aberdeen down to the S.E. corner of England, and then along the south coast to Devon; elsewhere grass (and trees) would have been the main crop. From various Government statements, and from estimates of the probable economic position, we could assume that post-war agriculture would be of very great national importance. The planning of the post-war policy was in many ways much more intricate than that of war-time farming, in which the producers were told exactly what was required of them and knew where they were financially. He believed it to be true that the general standard of farming had risen since the outbreak of war, and he attributed this to the relative stability of the conditions. For post-war purposes, we must know what percentage of the national food consumption we were to attempt to produce, and also on which items we ought to concentrate. He thought that our most probable policy would be to combine milk and meat production with arable farming, but this would greatly influence other aspects of farming. Thus grass would always be the chief source of animal food, and it was fortunate that farmers now had at their disposal methods of improving the efficiency of grassland. As mixed grazing was superior to other forms, mutton production would be encouraged, and since grass was a seasonal crop it would be necessary to increase the production of fodder crops, dried grass and silage. Poultry were great improvers of grassland, and should be increased in numbers. Altogether, it seemed likely that animal husbandry would play a vital rôle in better farming of the future. He thought it likely that vegetable and fruit cultivation would be increased, and suggested that an increase in the numbers of bees which were kept would facilitate pollination. Local canning factories were a probable development. We could make ourselves capable of supplying the whole of our liquid milk and potato requirements, about 80 per cent. of our eggs, 60 per cent. of our meat, 35 to 40 per cent. of our cheese, and much of our malting barley. We should not aim at producing more than about 10 per cent. of our butter, and this only as a by-product of the milk industry. Contract schemes were not a novelty, and would certainly be introduced; they gave stability, and allowed stipulation as to the requisite standards for each commodity. The discussion of Sir John's paper was carried on by Mr. Garner and others. The campaigns for improving grassland and for combating the diseases of cattle were welcomed, but it was pointed out that the scrub bull scheme did not necessarily prevent the indiscriminate crossing of breeds. One speaker said that it would be interesting to know not how many pounds of concentrates ought to be fed for each gallon of milk produced, but how many were being fed throughout the country: he believed that the figure would not be under 6 lb. per gallon. The necessity for rigorous culling of stock was urged by another speaker, who said that many of our cattle were unworthy of feeding.

The day's proceedings were summarised by Sir Joseph Barcroft, who had shared tenure of the Chair with Sir Wilson Jameson. He thought that the meeting had begun on a note of demand, *i.e.*, what we needed, and had finished on a note of supply, *i.e.*, what the farming community could produce. This transition was an excellent reflection on the quality of the discussions. Altogether there had been an urge to action, a feeling that "something should be done about it" although it was not always clear what that "it" should be. Perhaps he might suggest that the Committee of the Society could well elaborate its machinery in order that it might define what that "it" really was and so make it possible for the resultant views to be brought before the appropriate bodies.

Man did not live by calories alone, but nor did he live by milligrammes alone, and as one of the older physiologists, whose early training had been influenced by Pavlov, he welcomed the mention of palatability in foodstuffs. Wastage among dairy herds had been mentioned, and wastage among vegetables had been referred to in passing by one speaker. This wastage, which included seasonal wastage, was a highly important subject, and he thought it might well form the basis of a whole day's discussion at a future meeting of the Society.

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RED CROSS FUND: AGRICULTURE'S SHARE

The Duke of Gloucester presided at the recent meeting of the Fund bearing his name, when Lord Iliffe, Chairman of the Executive, announced that on February 28th—after two and a half years of war—the Red Cross Fund totalled £10,206,372, of which, it was later stated, all but just over £300,000 had been spent.

With the extension of the war, the demands upon the Fund will inevitably greatly increase, and the Red Cross and St. John War Organisation must look more and more to this country for money; for overseas countries, hitherto liberal contributors, now have to provide for their own home needs.

Referring to the Red Cross Agriculture Fund, which up to the end of February had contributed £878,157, the report submitted to the meeting (at which Mrs. Winston Churchill was present) stated that the activities of the Executive Committee of this Fund had been attended with remarkable success. Substantial sums of money had been raised largely through auction sales of farm produce and implements presented by generous donors. In addition many ingenious methods of raising money in the country districts had been employed with considerable effect.

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LEGAL NOTES

Cat Subjected to Unnecessary Suffering: Unqualified Woman Practitioner Fined and Warned at Oxford.—The *Oxford Times* records that at Oxford City Court, recently, Miss Rose Drake, of the Animal Clinic, Cowley Road, was summoned for causing unnecessary suffering to a cat by unreasonably omitting to give it proper and necessary care and attention when in a suffering state. She was represented by Mr. F. Winstanley, and pleaded "Not guilty."

Mr. Gordon Jones, prosecuting for the R.S.P.C.A., said this case typified the evil of the unqualified veterinary practitioner. Miss Drake had practised a considerable time, holding herself out as able and willing to treat animals, and had taken fees. He understood that she was not qualified by diploma to perform such treatment.

Miss Muriel Jacobs, of 15*b*, Cross Street, said she had a black cat, and for several days it had been dragging its back legs and could not stand. She took it to Miss Drake and asked her if she could do anything for it. Miss Drake said it had a fractured pelvis, but she did not know whether it was a compound fracture or not, and that they had better have an X-ray at the Radcliffe Infirmary. She agreed to keep it until after the X-ray. The witness called for the cat the next day, and Miss Drake gave her some powders which she was told contained a drug and which Miss Drake said would heal the fracture internally. Miss Drake said the X-ray had been taken, and that it was "definitely a fracture." Miss Drake told her to get some olive oil, or melt down some vaseline, and massage the cat's back legs. She took the cat home and, as it got worse, took it on January 24th to Mr. Heather, the veterinary surgeon.

By Mr. Winstanley: Miss Drake did not mention spinal meningitis, or say that nothing could be done for the cat and that she ought to have it painlessly destroyed. Miss Drake did not tell her to call in a veterinary surgeon, but told her that if she gave the cat the powders and massaged its hindquarters it would be well in about six weeks.

Mr. E. J. Heather, veterinary surgeon, of Iffley Road, said the cat was brought to him in a semi-comatose condition. The abdomen was greatly distended, due to a dilated bladder, caused through an obstruction of sandy material. There was no injury to any other part of the body and no possible symptom of a fractured pelvis. The cat must have been in the greatest pain for at least five days. Had the cat had a fractured pelvis the powders or massaging would have had no beneficial effect. With the right diagnosis and treatment the pain could have been alleviated.

By Mr. Stanley: There was nothing to suggest that the cat was suffering from spinal meningitis.

Miss Drake said she diagnosed a fractured pelvis or spinal meningitis and at once advised Miss Jacobs, several times, to have the cat put to sleep, as she did not think it would recover. Miss Jacobs kept crying and refused to have the cat destroyed. She then advised her to have an X-ray and a second opinion. She made the following entry in her day book: Diagnosis—Paralysis, fractured pelvis or spinal meningitis; cat kept at clinic to-night. Cat very ill; best destroyed. Treatment—Advised second opinion; advised X-ray on Friday.

The next morning the cat was worse, and when Miss Jacobs called the witness said the cat ought to be destroyed; she also again advised calling in a second opinion.

She denied giving Miss Jacobs any powders, although she admitted that the writing on the packet was hers. She could give no explanation how the powders got into Miss Jacobs' possession.

By Mr. Jones: She had no veterinary qualifications. She had only received a few weeks' training in lethalising animals, but had worked for some time for the People's Dispensary for Sick Animals. She denied that Insp. Francis had warned her of the risk she took in treating animals.

Miss Drake was found "Guilty," and it was stated that in May, 1940, she had been fined £6, with seven guineas costs, for causing unnecessary suffering to a cat.

She was fined £15, and ordered to pay £2 2s. costs for the veterinary surgeon and £3 3s. for the advocate's costs. The Mayor said this was a serious case, and he had been asked to warn Miss Drake that if she came before them again she would in all probability be sent to prison.

* * * * *

Failure to Notify Tuberculosis.—Prosecuting in a case at Bury St. Edmunds in which a cow was stated to have a cough "of the type associated with tuberculosis in cattle," Mr. Thomas Wilson (the Town Clerk) spoke of the great efforts made to stop the spread of tuberculosis, and said that when a man, for his own profit, put an animal, which ought to have been destroyed, into the market he was acting very much against the public good.

Mr. P. R. Turner, M.R.C.V.S., veterinary inspector at Bury Market for the Ministry, said the cow was slaughtered with defendant's consent. *Post-mortem* examination revealed advanced tuberculosis. Replying to Mr. Wilson's enquiry if he considered that, from the general appearance of this cow, any man who had any experience of cows would suspect tuberculosis, Mr. Turner replied: "I think it was staring anybody in the face."

The defendant (F. Hobbs, farmer, of Soham), who stated that had he had any idea that this cow, which had been on his farm for ten years, was suffering from tuberculosis, he would have sold her to a knacker, was fined £20 and £1 5s. 6d. costs, the Chairman saying that the Bench regarded the case as a very serious one.

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A suggestion that yew trees should be destroyed because of cattle losses by poisoning was made in a resolution put before the Gloucestershire Executive of the N.F.U.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.
The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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THE PROFESSION AND PUBLICITY

To the Editor of the Veterinary Record

Sir,—At the risk of seeming to butt in where I do not belong, I would like to support Mr. C. R. A. Powell's letter on "The Profession and Publicity" in your issue of March 21st. A better understanding of how the veterinary surgeon can help the farmer would be to the advantage of all concerned. One of the great difficulties which stand in the way of such better understanding is the still too prevalent habit among farmers of thinking of the veterinary surgeon only when the farmer is in trouble—and pretty deep at that. The farming papers can do little to break down such an attitude without the collaboration of your profession. In so far as *The Farmer's Weekly* can assist, it is at your disposal. It is up to you.

Yours faithfully,
Malcolm Messer,
Editor, *Farmers' Weekly*.

43, Shoe Lane, London, E.C.4,
March 23rd, 1942.

BOVINE INFERTILITY

To the Editor of the Veterinary Record

In reply to Mr. Smythe's "witticism," I would like to point out to him that the mere fact that a treatment is sufficiently successful to be adopted as a routine procedure in no way detracts from the skill necessary for its effective and safe administration.

Judging from the small number of veterinary surgeons professing themselves competent in the technique of intrauterine irrigation prior to the work of the Survey Committee, he can be assured that the encroachment he appears to fear from the local castrator will not materialise.

My experience of ten years in practice confirms the oft-repeated teaching of the London Veterinary College that the degree of superiority of the professional man's services over those of the quack or castrator determines the existence of the latter in his district. If the difference is relatively small, only then need the practitioner expect considerable interference from his unqualified "competitors."

Perhaps Mr. Smythe would be constructive and at the earliest possible moment elaborate an article for publication in the *Record* giving us the benefit of his views on the best and correct treatment for bovine infertility.

The vast majority of the criticisms published in the *Record* are merely destructive and there is good reason to suggest that a change over to constructive criticism would be far more helpful to the practitioner. This could best be accomplished by the publication of alternative efficient methods of treatment capable of practical application.

Yours faithfully,
K. G. Morgan, M.R.C.V.S.

574, Winchester Road,
Southampton.
March 23rd, 1942.

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To the Editor of the Veterinary Record

Sir,—Mr. R. H. Smythe, in his amusing letter on the above subject in your issue of March 21st, overlooks the difficulty of the technique of uterine irrigation. As it takes a veterinary surgeon, who is of course familiar with the anatomical features, quite a time and a good deal of practice, to learn the technique, there does not appear to be any danger that the local castrator or other non-professional empiricist is likely to acquire or even attempt to acquire it.

There is, however, real danger that some of the oestrogens may get into the wrong hands. Mr. Smythe need not confine himself to aqueous iodine solution; *inter alia*, he will find dettol and acriflavine equally efficacious.

I am, Sir, etc.,
F. R. Roche-Kelly, *Major*.

Kent Farm,
Pontrug, Caernarvon.
March 23rd, 1942.

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AGRICULTURAL ADMINISTRATION, ETC.

To the Editor of the Veterinary Record

Sir,—I shall be grateful if you will grant me space to reply to Mr. Heather's views on Agricultural Administration, Veterinary Education and Unqualified Practice.

It is generally agreed that the era of unlimited competition producing excessive disproportion in wealth is rapidly passing in Europe, and it surely behoves us to ensure that the new order shall not, at any rate, be worse than its predecessor. The fact that nine-tenths of the means of production are in the hands of the few is no sufficient reason for the State to take them over but, on the contrary, it would seem more reasonable for the State to ensure that the vast majority of its citizens are property owners in some form or another. Thus, the land should rather be in units each capable of raising a healthy family, the owner tending and cultivating his land so that he passes it on to his children in at least as good condition as he received it. In this manner the productivity of the soil is conserved from generation to generation. Consider now the alternative; the farmer will be a civil servant chosen by his success in some kind of examination as a young man. As years pass, he will certainly not put in that extra work with a view to the future which is so necessary unless indeed he is driven on by the fear of punishment or dismissal by the all-powerful State. It is for this reason that a Civil Service can never be highly efficient in a State which shows clemency, and this limitation must be accepted except perhaps by the experimenter with a police State. The fact that the passing liberal order made the mistake of over-stressing the individual aspect of ownership while denying the communal aspect hardly justifies the new order in denying the individual and exaggerating the communal. A parallel case may make the point clear. Though the State may and should interfere with parents who neglect their children, it is not, therefore, implied that the State has superior rights to the parents over the children. As Mr. Heather states, "the history of ownership of our lands over the past thousand years gives the answer to the problem of the instability of our agricultural industry" but, from his brief synopsis, he appears to be ill-acquainted with that history.

To pass on to the veterinary surgeon. Among the small landowners he should belong in all senses to the locality where he works, he should know the conditions of agriculture, the people and, above all, he should play his full part in the social life and local government of the region which should be as autonomous as possible. I would suggest, too, that there should be small laboratories with an advisory staff dotted over the countryside from which he may obtain help. Such an organisation of agriculture corresponds to human nature and because of its intrinsic fitness must, if necessary, be fostered by the State.

With regard to education. I notice that Mr. Heather makes a fashionable attack on public schools. While it must be admitted that the essential ideal has become somewhat overlaid since the industrial revolution, yet they remain the sole institutions where education has a nobler end than sordid utilitarianism. Mr. Heather stresses the importance of technical training which, no doubt, has its uses. I do, however, agree with him that the veterinary student should have a "natural understanding of the animal being in health." In other words, the student should be recruited from the country generally and preferably be the son of a veterinary surgeon.

Finally, I must confess, Sir, that I am surprised that you should see fit to publish controversial matter of a political nature in a technical journal.*

Yours faithfully,
A. W. Gledhill.

289, Milton Road,
Cambridge.
March 25th, 1942.

* In publishing material such as that which has evoked comment in kind from our correspondent, we are mindful of the undertaking implicit in our title: to function as a medium for the dissemination of information and views on any subject—technical, political or admitting of no facile classification—provided only that it appertains to our calling.—*Editor.*

DISEASES OF ANIMALS ACTS, 1894 to 1937, and AGRICULTURE ACT, 1937 (PART IV)

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth-	Parasitic Mange*	Sheep Scab	Swine Fever
Feb. 16th to 28th, 1942	10	7	1	18	12
Corresponding period in—					
1941 ...	14	6	—	11	63
1940 ...	23	5	1	25	131
1939 ...	38	1	3	12	50
Total Jan. 1st to Feb. 28, 1942	56	10	9	80	73
Corresponding period in—					
1941 ...	88	77	4	74	440
1940 ...	204	12	8	74	658
1939 ...	177	26	14	119	209

Note.—The figures for the current year are approximate only.
* Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at 28th February, 1942, was as follows:—

England	Wales	Scotland	Total (Great Britain)
3,892	9,107	3,335	16,334